MEMORANDUM

To: Mission Critical Chemistry Team Members
CC:
From: Director of Chemistry Subdivision
Date: October 16, 2003
Re: Fuels

The chemistry team assigned to the Mission Critical Chemistry project has synthesized three powerful reductants for use in the new fuel system. These have been code named R_a, R_b, and R_c. Solutions of each of these reductants, with concentrations of 0.1M, are available in the laboratory simulator at the project web site (http://ir.chem.cmu.edu/mars/). We have also put a 0.1M solution of one of our standard oxidizing agents, O_s, in the laboratory. This oxidant has been well characterized over the past few years, and we know the following heats of formation:

$$H_f^o(O_s) = 395.7 \text{ kJ/mol} \qquad H_f^o(O_s^-) = 30.2 \text{ kJ/mol}$$

We have also done some initial physical characterization of the reductants, and the results are reported in the following table:

Compound	Molecular weight (g/mol)	Density (g/cm^3)	Heat Capacity (cal/g K)
R_a	84.3	1.41	0.57
R_b	34.5	1.36	0.23
R_c	61.2	0.53	0.89

The project web site contains a *User Guide* for the Virtual lab that describes most of the available features. In addition, the lab now includes a thermometer (above the pH meter) and the tools menu includes a Bunsen burner.

Note that you may assume that the thermodynamics of the reactions in water are identical to those that occur in the rocket engines.